CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: June 18, 2020

TO: Sheri Snowbank – Spooner Service Center

FROM: Wade Strickland – WY/3 Diane Fiscus for WS

SUBJECT: Water Quality-Based Effluent Limitations for the Lake Tomahawk Township Sanitary District 1 – WPDES Permit No. WI-0036374-7-0

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Lake Tomahawk Township Sanitary District (SD) 1 in Oneida County. This municipal wastewater treatment facility (WWTF) discharges to the Wisconsin River, located in the Rhinelander Flowage Watershed in the Upper Wisconsin River Basin. This discharge is included in the Wisconsin River Basin TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 003:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Bacteria						
Interim Limit Fecal Coliform				400 #/100 mL geometric mean		
Final Limit *E. coli*				126 #/100 mL geometric mean		2
Ammonia Nitrogen						1, 3
Phosphorus Interim Final				9.3 mg/L 0.36 lbs/day	0.12 lbs/day	4,5
Nitrite + Nitrate						6
Nitrogen, Total Kjeldahl						6
Total Nitrogen						6

Footnotes:

1. No changes from the current permit
2. Bacteria limits apply during the disinfection season of May through September. The fecal coliform interim limit will apply until the end of the compliance schedule when *E. coli* limits take effect. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
3. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.
4. The interim limit of 9.3 mg/L as a monthly average is equal to the 4-day P_{99} of effluent phosphorus data. If a phosphorus variance application is submitted to and approved by EPA, the interim limit may be extended beyond the end of the compliance schedule along with a

requirement for total phosphorus pollutant minimization program. The phosphorus mass limits are based on the Total Maximum Daily Load (TMDL) for the Wisconsin River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA on April 2019.

5. If the proposed phosphorus site-specific criteria are approved the following limits are recommended in place of the limits in the table above:
   - Monthly average Total Phosphorus mass limit of 0.31 lbs/day and no six-month average limit
   - Interim monthly average Total Phosphorus concentration limit of 9.3 mg/L
6. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen (total kjeldahl nitrogen and nitrate/nitrite) monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (all expressed as N).

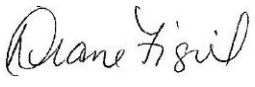
The recommended limits meet the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) and additional limits are not required.

Following the October 29, 2019 Department's WET Program Guidance Document, no WET testing is required.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Michael Polkinghorn at Michael.Polkinghorn@wisconsin.gov and Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (4) – Narrative, Map, Chronic Ammonia Limit Calculations, & Data Source Table

PREPARED BY: Michael A. Polkinghorn, E.I.T. – Water Resources Engineer

APPROVED BY:  Date: 06/18/2020

Diane Figiel, PE,
Water Resources Engineer

E-cc: Austin Griesbach, Wastewater Engineer – Rhinelander Service Center
Michelle Balk, P.E., Northern Region Wastewater Supervisor – Spooner Service Center
Diane Figiel, P.E., Water Resources Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Lake Tomahawk Township Sanitary District 1

WPDES Permit No. WI-0036374-7-0

Prepared by: Michael A. Polkinghorn, E.I.T.

PART 1 – BACKGROUND INFORMATION

Facility Description:
The wastewater treatment facility (WWTF), constructed in 1999, is designed to treat 0.054 MGD of influent and currently treats on average 0.027 MGD (April 2015 – December 2019). Primary treatment consists of three settling chambers operated in series for solids and debris removal. Secondary treatment is achieved by a dosing chamber evenly distributing wastewater to five recirculating sand filters (RSFs) operating in parallel where naturally occurring metabolizing microorganisms present on sand particles break down organic matter. Flow proceeds to a splitter box where wastewater is recirculated through the sand filters multiple times until effluent limits can be met. Tertiary treatment is achieved by ultraviolet disinfection during May – October. Effluent is discharged via a 1.75 mile force main to the wet bank of the Wisconsin River approximately 0.25 miles north of Birch Road. The solids from the settling chambers are pumped regularly to prevent the discharge of accumulated solids to the sand filters. These solids are considered septage and are regulated under ch. NR 113 Wis. Adm. Code for septage disposal.

Attachment #2 is a map of the area showing the approximate location of Outfall 003.

Existing Permit Limitations: The current permit, which expired on 03/31/2020, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Fecal Coliform May – September				400#/100 mL geometric mean		
Ammonia Nitrogen						2
Phosphorus						2

Footnotes:
1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. Monitoring only

Receiving Water Information:
- Name: Wisconsin River
- WBIC: 1179900

- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm water sport fish community, Exceptional Resource Water (ERW), non-public water supply.
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} value is from USGS for Station SW ¼, SW ¼, Section 36, T40N – R9E, where Outfall 003 is located. The 7-Q_2 value is estimated from the 7-Q_{10} value using a 7-Q_2/7-Q_{10} ratio of 1.65.
  7-Q_{10} = 127 cfs (cubic feet per second)
  7-Q_2 = 209 cfs
- Hardness This parameter is not needed due to lack of effluent data for toxic substances whose WQC is dependent on hardness. The application notification letter from the Department granted exemption from standard monitoring requirements.
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: 25%
- Source of background concentration data: This parameter is not needed for metal substances due to lack of effluent data. The application notification letter from the Department granted exemption from standard monitoring requirements. Background data for calculating effluent limitations for ammonia nitrogen and phosphorus are described later.
- Multiple dischargers: There are several other dischargers to the Wisconsin River however they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: Approximately 75 miles downstream of the outfall, the Wisconsin River is listed as impaired for total phosphorus under the Clean Water Act (CWA) Section 303(d). This facility is included in the WRB TMDL.

Effluent Information:

- Design Flow Rate(s):
  Annual average = 0.054 MGD (Million Gallons per Day)
  For reference, the actual average flow from April 2015 – December 2019 was 0.027 MGD.

- Hardness This parameter is not needed due to lack of effluent data for toxic substances whose WQC is dependent on hardness. The application notification letter from the Department granted exemption from standard monitoring requirements.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source (wastewater): Domestic wastewater with no industrial contributors.
- Total Phosphorus Wasteload Allocation:
  - Using current criteria = 34 lbs/year = 0.0931 lbs/day
  - Using site-specific criteria = 60 lbs/year = 0.164 lbs/day

  The wasteload allocations (WLA) found in Appendices J and K of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019
- Additives: None.
- Effluent characterization: This facility is categorized as a minor municipality; the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, was waived in the application notification letter.
  Additional ammonia nitrogen data for this facility from February 2008 – October 2013 (n = 8) is used to calculate P_{99} statistics for comparison to calculated limits.

The following table presents the average concentrations and loadings at Outfall 003 from April 2015 – December 2019 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

	Average Measurement
BOD_5	11 mg/L*
TSS	7.4 mg/L
pH field	6.76 s.u.
Fecal Coliform	17

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that the Lake Tomahawk Township SD 1 does not currently have ammonia nitrogen limits the need for limits is evaluated at this time.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):
Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - pH)})] + [B \div (1 + 10^{(pH - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 231 sample results were reported from April 2015 – December 2019. The maximum reported value was 7.03 s.u. (Standard pH Units). The effluent pH was 7.03 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.10 s.u. and the mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.10 s.u. Therefore, a value of 7.03 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.03 s.u. into the equation above yields an ATC = 35.1 mg/L.

Potential Changes to Daily Maximum Ammonia Nitrogen Effluent Limitations:
Subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) specifies methods for the use of the 1-Q_{10} receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q_{10} (estimated as 80 % of 7-Q_{10}) and the 2×ATC approach are shown below.

	Ammonia Nitrogen Limit mg/L
2×ATC	70
1-Q_{10}	43,000

The 2×ATC method yields the most stringent limits for Lake Tomahawk Township SD 1.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – WWSF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC):
The weekly and monthly average ammonia nitrogen limits calculation from the previous WQBEL memorandum (July 2014) do not change because there have been no changes in the effluent and receiving water flow rates. In addition, the amount of dilution between the Wisconsin River and Outfall 003 result in chronic ammonia nitrogen limits that are two orders of magnitude greater than representative effluent data. This comparison is discussed in the next section and the calculations from the previous WQBEL memorandum (July 2014) are included as attachment #3.

Effluent Data:
The following table evaluates the statistics based upon ammonia data reported from February 2008 – December 2017, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Lake Tomahawk Township SD 1 permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit. Based on this comparison, limits are not required during the reissued permit term.

Attachment #1

	Ammonia Nitrogen mg/L
1-day P_{99}	33
4-day P_{99}	22
30-day P_{99}	16
Mean*	14
Std	12
Sample size	12
Range	6.3 – 24

*Values lower than the level of detection were substituted with a zero

Conclusions and Recommendations:
Ammonia nitrogen limits are not recommended during the reissued permit term. Monitoring is recommended to continue during the reissued permit term to evaluate the need for limits at the next permit issuance.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Code became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because the Lake Tomahawk Township SD 1 permit requires weekly monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season.

Interim Limit:
At this time, there is no effluent *E. coli* data available to determine if these limits are currently met. The permit will include a compliance schedule to meet these limits. During the compliance schedule, an interim limit applies to prevent back-sliding from the current level of disinfection during the compliance schedule period. Therefore, the current fecal coliform limit shall be included in the reissued permit as an interim limit of 400 counts/100 mL as a monthly geometric mean. Any weekly geometric mean limit which was included in the current permit for expression of limits purposes does not need to be included in the permit as an interim limit.

PART 4 – PHOSPHORUS

Technology Based Phosphorus Limit:
Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because Lake Tomahawk Township SD 1 does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04 (1) (a) 1, Wis. Adm. Code and therefore a technology-based limit is not required.

Month	Result mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
Jan. 2019	5.6	0.75	35
May 2019	6.2	1.0	53
Aug. 2019	3.3	0.96	26
Dec. 2019	4.5	0.73	27
Average =			35

Total P (lbs/month) = Monthly result (mg/L) × total flow (MG/month) × 8.34 (lbs/gallon)
Where total flow is the sum of the actual (not design) flow (in MGD) for that month

In addition, the need for a WQBEL for phosphorus must be considered.

Water Quality-Based Effluent Limits (WQBEL):
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

TMDL Limits:
Total phosphorus (TP) effluent limits in lbs/day are calculated as recommended in the *TMDL Implementation Guidance for Wastewater Permits* (October 1, 2019). The wasteload allocations (WLA) found in Appendix J of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019 are expressed as maximum annual loads (lbs/year) and maximum daily loads (lbs/day). These values are 34 lbs/year and 0.0931 lbs/day respectively for the Lake Tomahawk Township SD 1. The daily WLAs in the WRB TMDL equals the annual WLA divided by the number of days in the year. Therefore, the daily WLA is an annual average. Since the derivation of daily WLAs from annual WLAs does not take effluent variability or monitoring frequency into consideration, maximum daily WLAs from the WRB TMDL should not be used directly as permit effluent limits.

For the reasons explained in the April 30, 2012 paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, WDNR has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL.

Therefore, limits given to continuously discharging facilities covered by the WRB TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

TP Equivalent Effluent Concentration = Daily WLA ÷ (Flow Rate * Conversion Factor)
= 0.0931 lbs/day ÷ (0.054 MGD * 8.34)
= 0.207 mg/L

Since this value is less than 0.3 mg/L, both a six-month average mass limit and a monthly average mass limit are applicable for total phosphorus. The monthly average limit is set equal to three times the six-month average limit.

TP Six-Month Average Permit Limit = Daily WLA * six-monthly average multiplier
= 0.0931 lbs/day * 1.30
= 0.12 lbs/day

TP Monthly Average Permit Limit = TP six-Month Average Permit Limit * 3
= 0.12 lbs/day * 3
= 0.36 lbs/day

The multiplier used in the six-month average calculation was determined according to TMDL implementation guidance. A coefficient of variation was calculated based on phosphorus mass monitoring data to be 0.48 (n = 19). TMDL guidance recommends using a CV of 0.6 when there is less than 24 detect values of representative effluent phosphorus data available. It is also believed that the optimization of the wastewater treatment system to achieve the WLA-derived phosphorus permit limits will reduce effluent variability. Thus, the maximum anticipated coefficient of variation expected by any facility is 0.6. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as quarterly; if this monitoring frequency is changed to less than weekly, the stated limits should be reevaluated.

The WRB TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards for tributaries to the Wisconsin River. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation. Six-month average limits apply in the periods May – October and November – April.

Proposed Site-Specific Criteria for Phosphorus:
The WRB TMDL report includes two sets of wasteload allocations. The WLA in Appendix J of the report are based on the current promulgated water quality criteria and the allocations in Appendix K are based on proposed site-specific criteria (SSC) for Lakes Petenwell, Castle Rock, and Wisconsin. If the total phosphorus limits were to be calculated based on the proposed SSC in Appendix K, this would result in phosphorus limits that are different from those calculated above.

If the WLA presented in Appendix K based on the proposed SSC were used, the annual allocation would be 60 lbs/year and the equivalent concentration would be 0.365 mg/L at the facility design flow of 0.054 MGD. Since this value is greater than 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no six-month average limit is required.

TP Monthly Average Permit Limit = daily WLA * monthly average multiplier
= 0.164 lbs/day * 1.90
= 0.31 lbs/day

The multiplier used in the monthly average calculation was determined according to TMDL implementation guidance. A coefficient of variation of 0.6 and effluent monitoring of weekly or less results in a monthly average multiplier of 1.90.

It is important to note that implementation of the WLA contained in Appendix K can only occur if the SSC are promulgated by the State of Wisconsin and approved by USEPA. If this occurs, WDNR will notify stakeholders that adoption of the SSC has occurred and submit the necessary documentation to USEPA to confirm that the SSC-based WLAs will be implemented in future WPDES permits. From that point forward, SSC WLAs would be implemented in WPDES permits via permit modification or reissuance.

The WLAs contained in Appendix K only apply to the proposed SSC values in the WRB TMDL report; if SSC values other than those proposed in the WRB TMDL report are approved, then the WLA in Appendix K cannot be used and a new set of WLA would have to be calculated and documented in an updated version of the TMDL. A revised TMDL would have to go through the public approval process outlined in ch. NR 212.77, Wis. Adm. Code, and be re-submitted for USEPA approval.

Effluent Data:
The following table lists the statistics for effluent phosphorus levels from April 2015 – February 2020. Since this is a limited data set, previous concentration data was also considered and evaluated from May 2002 – February 2020. Reporting the mass discharge is not required in the current permit; the mass is calculated using the reported phosphorus concentration and the effluent flow rate for that day.

	April 2015 – February 2020		May 2002 – February 2020
	Concentration (mg/L)	Mass Discharge (lbs/day)	Concentration mg/L
1-day P_{99}	13	3.4	11.8
4-day P_{99}	9.3	2.2	8.2
30-day P_{99}	7.1	1.6	6.3
Mean	6.0	1.3	5.4
Std	2.3	0.6	2.0
Sample Size	20	20	40
Range	3.3 – 12	0.6 – 2.6	0.51 - 12

Interim Limit:
An interim limit is needed when a compliance schedule is included in the permit to meet the TMDL limits. This limit should reflect a value which the facility is able to currently meet; however, it should also

consider the receiving water quality, keeping the water from further impairment. It is recommended that the interim limit be set equal to 9.3 mg/L, expressed as a monthly average. This value reflects the 4-day P_{99} concentration of 9.3 mg/L from April 2015 – February 2020 effluent data. This value is recommended instead of the 30-day P_{99} concentration of 7.1 mg/L to allow operational flexibility when the facility begins to initiate phosphorus treatment optimization activities, which often consist of trial and error. In addition, the 4-day P_{99} is 95% compliant compared to monthly average phosphorus data.

Conclusions:
In summary, the following limits are recommended by this evaluation:

- Monthly average Total Phosphorus mass limit of 0.36 lbs/day
- Six-month average Total Phosphorus mass limit of 0.12 lbs/day
- Interim monthly average Total Phosphorus concentration limit of 9.3 mg/L

If the proposed site-specific criteria are approved the following limits are recommended:

- Monthly average Total Phosphorus mass limit of 0.31 lbs/day
- Interim monthly average Total Phosphorus concentration limit of 9.3 mg/L

PART 5 – THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >20:1), the lowest calculated limitation is 120° F (s. NR 106.55(6)(a), Wis. Adm. Code). At temperatures above approximately 103° F, conventional biological treatment systems do not function properly and experience upsets. There is no indication that this has ever occurred in this treatment system. Therefore, there is no reasonable potential for the discharge to exceed this limit. No monitoring or effluent limits are recommended for temperature.

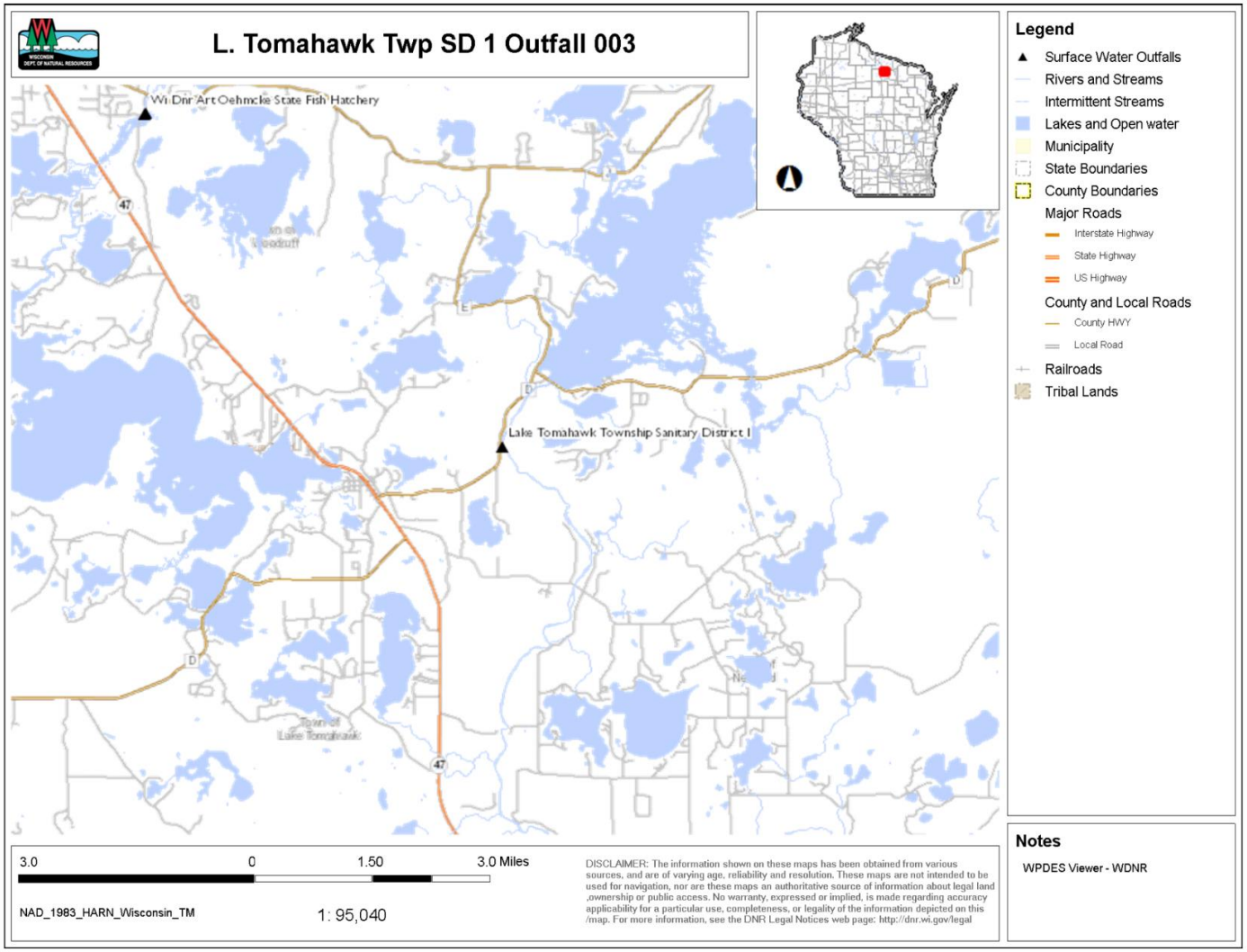
PART 6 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the WET Program Guidance Document (October 29, 2019).

- Chronic testing is usually not recommended where the ratio of the 7-Q_{10} to the effluent flow exceeds 100:1 and acute testing is not typically recommended if the ratio exceeds 1000:1. For the Lake Tomahawk Township SD 1, that ratio is approximately 1,517:1. With this amount of dilution, there is

believed to be little potential for acute or chronic toxicity effects in the Wisconsin River associated with the discharge from this facility, so the need for acute and chronic WET testing will not be considered further.

Attachment #2



Attachment #3

Ammonia Limit Calculations Summary – Lake Tomahawk Sanitary District No. 1		
Classification:	FAL	(Wisconsin River WWSF)
Effluent Flow (MGD):	0.054	(Qe average daily design flow)
Maximum Effluent pH (s.u.):	7.45	(1-day p99, w/n = 1,609)
Background Info:	Summer	Winter
Temp. (deg C, default)	25	3
pH (std. units, default)	7.73	7.57
% of river flow used:	100	25
Reference weekly flow, 7Q10 = 127 cfs	127	31.75
Reference monthly flow, 7Q2 = 209 cfs	209	57.75
Criteria (in mg/L):	Summer	Winter
Acute	21.41	21.41
4-day Chronic (ELS present)	4.40	10.23
30-day Chronic (ELS present)	1.76	4.09
Effluent Limits & Recommendations:	**Summer**	**Winter**
Daily maximum – no limit recommended	43 mg/L	43 mg/L
Weekly ave. - no limits recommended	6,600 mg/L	3,900 mg/L
Monthly ave. – no limits recommended	3,700 mg/L	2,100 mg/L
The summer period is from May to October and winter is from November to April.		

Data	Source	Start Date	End Date	Sample Count	Notes
Receiving Water - Wisconsin River					
WBIC	WPDES viewer	-	-	-	1179900
Classification	Permit Fact Sheet, WPDES viewer	-	-	-	WWSF, ERW
Flow (Qs)	USGS Data - Station SW ¼ - SW ¼ of Section 36; T40N – R9W	-	-	2	7Q10, 7Q2 is estimated
Ammonia	Previous WQBEL memorandum	July. 2014	-	2	Two season default values
Temperature	Previous WQBEL memorandum	July. 2014	-	2	Two season default values
pH	Previous WQBEL memorandum	July. 2014	-	2	Two season values based on RW hardness
Multiple Dischargers	WPDES viewer	-	-	-	None in vicinity
Alternative % Low Flow	NR 106.06(4)(c)5	-	-	-	25% Default
Watershed/Basin	SWAMP	-	-	-	Rhinelander Flowage/Upper Wisconsin River
Impaired Water Status	WPDES Viewer	-	-	-	None known, WRB TMDL
Effluent - Lake Tomahawk Township SD 1					
Annual Average Design Flow	Permit Application	-	-	1	0.054 MGD
Design BOD Load	Facility Diagram	-	-	1	142 lbs/day
Actual Flow (Qe)	Discharge Monitoring Reports	April. 2015	Dec. 2019	1,736	Continuous discharger
Actual BOD	Discharge Monitoring Reports	April. 2015	Dec. 2019	231	
TSS	Discharge Monitoring Reports	April. 2015	Dec. 2019	231	
Ammonia	Discharge Monitoring Reports	Feb. 2008	Dec. 2017	12	4 values from current term, 8 from previous term
Chloride	Not monitored	-	-	0	Application letter monitoring exemption
Phosphorus	Discharge Monitoring Reports	April. 2015	Dec. 2019	19	mg/L, mass values in lbs/day calculated
Phosphorus (WLA)	Appendix J (Current Criteria)	-	-	2	WRB TMDL, annual and daily mass loading
Cadmium	Not monitored	-	-	0	Application letter monitoring exemption

Chromium	Not monitored	-	-	0	Application letter monitoring exemption
Copper	Not monitored	-	-	0	Application letter monitoring exemption
Lead	Not monitored	-	-	0	Application letter monitoring exemption
Nickel	Not monitored	-	-	0	Application letter monitoring exemption
Mercury	Not monitored	-	-	0	Application letter monitoring exemption
Zinc	Not monitored	-	-	0	Application letter monitoring exemption
Max Temperature	Not monitored	-	-	0	Temperature not monitored in DMR
pH	Discharge Monitoring Reports	April. 2015	Dec. 2019	231	
Additives	Permit Application	-	-	-	None used at facility
Acute Dilution Factor (ZID)	SWAMP	-	-	-	Not used
Effluent Fraction Withdraw	Permit Application	-	-	-	All effluent is discharged
Water Source (Wastewater)	Permit Application	-	-	-	Domestic wastewater with no industrial contributors
Ammonia Max Effluent pH	Ammonia Guidance	Jan. 2020	-	1	Upper 99th percentile used